PATENT SPECIFICATION 683,072

Date of filing Complete Specification : Nov. 13, 1950.

Application Date : Nov. 16, 1949. No. 29321/49.

Complete Specification Published : Nov. 19, 1952.

Index at Acceptance :—Classes 52(i), V2 ; 52(ii), B1g ; and 69(ii), P(6h : 10x).

COMPLETE SPECIFICATION.

Improvements in Hospital Beds.

We, ESSEX AERO LIMITED, a British Company, and REGINALD JACK CROSS and FREDERICK GLYN HUGHES, both British Subjects, all of London East Airport, Gravesend, Kent, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to improvements in hospital beds and analogous articles of furniture of the kind having a patient-supporting platform mounted upon a separate chassis furnished with retractable wheeled undercarriages. Such a bed is described in the co-pending Patent Applications Nos. 29319/49, 29320/49, 29323/49 and 29324/49 (Serial Nos. 683,070, 683,071, 683,073 and 683,074).

In the drawings:

Fig. 1 is a perspective view of the bed with the patient-supporting platform mounted on a chassis furnished with retractable wheeled undercarriages.

Fig. 2 is a side elevation of the bed with part of the operating mechanism shown in dotted lines.

Fig. 3 is an elevation of one of the wheeled undercarriages adapted for mounting in a fore-and-aft member of the chassis.

Figs. 4 and 5 are sectional views respectively on the lines A—A and B—B of

SPECIFICATION NO. 683,072

INVENTORS:- REGINALD JACK CROSS AND FREDERICK GLYN HUGHES

By a direction given under Section 17(1) of the Patents Act 1949 this application proceeded in thenames of Essex Aero Limited, a British company, and Reginald Jack Cross, a British subject, both of London East Airport, Gravesend, Kent.

THE PATENT OFFICE,
17th March, 1953

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undercarriages beneath the head of the bed being supported independently of the said pair of undercarriages by a further hydraulically operated jack or jacks.

According to a further feature of the invention, the fluid for the hydraulic mechanism is contained within a reservoir constituted by a tubular transverse bracing member of the chassis.

In order that the invention may be more readily understood, reference will be made to the accompanying drawings which illustrate by way of example a preferred embodiment thereof applied to the improved hospital bed which forms the subject of the

[*Price* 2*s.* 8*d.*]

chassis.

The chassis of the bed consists of a structure composed of two main tubular members 23 and 24 of arcuate formation disposed fore-and-aft in spaced parallel relationship and connected at the foot end by a cross member 25 and at the head end by a housing 26. The ends of the arcuate chassis members are turned downwardly to constitute feet upon which the bed will stand when the wheeled undercarriages are retracted. The housing 26 encloses a single castoring wheel 31 mounted on the ram of a hydraulic jack and the arcuate members 24 and 23 carry respectively castoring

wheels 27 and 28 also each mounted on a hydaulic jack, at a point between the centre-of-gravity of the whole bed and the foot-end of the chassis. The three jacks which are hereinafter more fully described are operated by a hydraulic pressure system enclosed within the tubular structure of the chassis members 23 and 24. The reservoir for the hydraulic fluid is formed by the cross member 25 visible in Fig. 1 and the jacks are operated by a pedal 29 projecting from the chassis, in a position where it can conveniently be actuated by a person standing at the foot of the bed. A pressure-release valve is arranged to be operated by a lever 32 suitably situated near to the said pedal, to enable the undercarriage wheels to be retracted and the bed lowered on to the chassis feet by a simple movement of the foot. The arrangement is such that the undercarriage wheels are capable of retraction to a height at which they will be well clear of the feet of persons standing at the side of the bed.

In the present embodiment of the invention in which the two main arcuate members 23 and 24 are of tubular construction the ends of the reservoir cross member 25 are welded to the borders of holes cut in the inner sides thereof at each end, at a position near to the feet of the chassis. As shown in Figs. 8 and 9 the ends of the reservoir tube 25 are sealed by bulk-heads 230 and 231 welded in position and drilled to receive bolted flanged pipe connections 232 by which the piping is passed through the bulkheads. Where it is desired to provide an equalising pipe-connection between two of the undercarriage jacks said connection for example, the pipe 172 in Fig. 10, may pass through a tube 234 extending lengthwise through the reservoir, emerging at each end through the bulk-head. The reservoir tube is conveniently provided with a filler-cap 236 and drain plug 237.

The feet of the chassis members are preferably fitted with rubber or other resilient beading around the rim of the tubular structure of which they are composed, such beading serving to exclude dust from the interior of the structure, providing a non-skid surface adapted to seat snugly upon an uneven floor, and absorbing noise and other vibrations transmitted through the floor.

The manner in which the main wheels are mounted on the chassis and the hydraulic operating mechanism therefor is described with reference to Figs. 3, 4 and 5. The mountings and the operating mechanism for both wheels is similar and will only be described with reference to wheel 28.

The wheel 28 is freely mounted on an axle 121 carried in a conventional manner by a fork 122 having a spigot 123 rotatably mounted in a tubular casing 124. The casing 124 is supported by means of lugs 125 and 126 on a hydraulically controlled lever system by which the casing 124 and wheel 28 can be moved in relation to the chassis to lift the chassis when the wheel engages the ground.

The aforesaid lever system is mounted on the chassis about the torque shaft 128 and comprises a cradle 127 fixed to the chassis. The cradle 127 is provided with bearings 131 in which is pivotally supported a lever member 132. One end of the lever 132 is pivotally connected by a spindle 133 to the lug 125 on the wheel supporting casing 124 and the other end of the lever is pivotally connected by a pin 134 to the ram 135 of a hydraulic jack 136. The casing 124 is maintained in a substantially vertical position by means of a link 137 pivotally connected at one end by a pin 139, to the cradle 127. The cradle 127 is apertured at 129 and 129*a* so that the torque shaft 128 can be slid through when the parts are assembled and pinned to lever 132 and the corresponding lever which operates the wheel 27 in order that the two lever systems may be mechanically connected and thus positively synchronised.

In operation the wheel 28 which in Fig. 3 is shown in its raised position, is lowered by pumping fluid into the jack 136, this causes the ram 135 to move outwards and tilt the lever 132 so that the casing 124 and the wheel 28 first move towards the ground and then raise the chassis off its feet. In practice, fluid is fed at the same time to the hydraulic mechanism of wheel 27 and the two wheels move together, synchronisation of their movements being assured by the aforementioned mechanical interconnection through the torque shaft 128. After the pressure has been released by pedal 32 (Fig. 2) the chassis descends under the weight of the bed and the wheel is again raised by means of a flexible cable 141. This cable which passes over a sheave 142 pivotally carried in a bracket 143 mounted on the cradle 127 and chassis member 24, is attached at one end to a projection 144 on the link 137 and at its other end to a spring 145 (Fig. 2) connected to the head-end of the chassis at 146. Sufficient initial tension is provided in the spring 145 to enable it to restore the wheel to its raised position after the pressure on the jack has been removed.

The rear wheel undercarriage and the hydraulic operating mechanism therefor is shown in Figs. 6 and 7. The wheel 31 is mounted in a fork 147 having a spigot rotatably supported in a tubular casing 148. The casing 148 is in turn supported by means of spindles 149 and 151 carried in lugs formed on the casing 148, on a hydraulically controlled lever system by

means of which the wheel 31 can be pushed downwardly in relation to the chassis so as to roll upon the ground.

The lever system for the rear wheel comprises a lever 152 having trunnions 153 and 154 mounted in bearings 155 and 156 in a cradle 157 rigidly fixed to the chassis housing 26. One end of the lever 152 is pivotally connected to the casing 148 by the spindle 149 and the other end of the lever is pivotally connected by a pin 158 to the ram 159 of a hydraulic jack 161. The casing 148 is maintained in a substantially vertical position by means of a link 162 pivotally connected at one end to the casing by the pin 151, and at its other end to the cradle 157 by a pin 150.

In operation the wheel 31 which in Fig. 6 is shown in its retracted position is moved in relation to the chassis by pumping fluid into the jack 161, this causes the ram 159 to move upwards and tilt the lever 152 so that the wheel 31 which is already on the ground raises the head-end of the chassis off its feet until the wheel assumes the position shown in dotted lines in relation to the housing 26. When the pressure in the hydraulic system is released the chassis descends under the weight of the bed which is again carried by the chassis feet.

Normally the chassis rests on its feet which are cushioned with rubber to prevent damage to floors, and is raised on its wheels by operating the pump pedal 29 (Fig. 2) only when it is desired to move the bed.

The hydraulic jacks for the operating mechanism of the undercarriages are fed with fluid under pressure by means of two pumps one of which 163 is shown in Fig. 2. These pumps are operated by the pedal 29 which is adapted to be depressed by foot and returned to its raised position by means of the springs 164. When it is desired to lower the chassis on to its feet the pressure in the pipe lines to the jacks can be released by means of a pressure release valve actuated by a foot lever 32.

The hydraulic system for operating the undercarriage is shown diagrammatically in Fig. 10. Referring to this Figure it will be seen that the pumps 163 and 163*a* the piston rods 160 and 160*a* of which are adapted to be mechanically connected by the pedal 29 (Fig. 2). are fed with fluid from the reservoir 25 through pipes 165 and 165*a*. The filler cap of the reservoir is provided with an air vent 166 and the pipes 165 and 165*a* are provided with non-return valves 167 and 167*a*. The output side of the pumps is also connected through pipe lines 168 and 168*a* and non-return valves 169, 169*a* and 171 with the main wheel operating jacks 136 and 136*a*. The two pipe lines 168 and 168*a* are balanced with a connecting pipe line 172 and the operating rams of the jacks 136 and 136*a* are adapted to be mechanically connected by torque shaft 128. The jack 161 for operating the single wheel at the head of the bed is connected to the pump 163 through the pipe line 173 and the non-return valve 169. The reservoir and all the pipe lines to the jacks are connected to the pressure release valve 174 through pipes 175, 175 and 177.

On operation by the foot pedal 29 (Fig. 2) the pumps suck fluid from the reservoir 25 and pump it through the non-return valves 169 and 169*a*. The pump 163*a* pumps the fluid direct to the main wheel jack 136*a* and via balance pipe 172 to main wheel jack 161, the non-return valve 171 being such that it will only operate under considerable pressure. When jack 161 has been pumped out to its fullest extent, there will be enough pressure to operate non-return valve 171, the fluid then passing along the pipe 168 to the main wheel jacks 136 and 136a.

The above arrangement ensures that the jack 161 is served by one pump and due to non-return valve 171 the head of the bed will be raised first (once the main wheels 27 and 28 have touched the ground) which is considered better from the patient's point of view. Also the valve 171 avoids any rocking of the bed which might take place if the jack were not fully extended.

The pressure release valve 174 which releases the pressure in both pipe lines 176 and 177 simultaneously releases the pressure in the whole system, the weight of bed and patient or bed alone forces the fluid back into the reservoir. Once the bed chassis is on the floor, the main wheel return springs 145 (Fig. 2) continue to pull the main wheels 27 and 28 clear of the ground until the jacks are fully closed.

What we claim is:—

1. A hospital bed comprising a patient supporting platform mounted on a chassis, a pair of transversely aligned retractable wheeled undercarriages located between the centre of gravity of the bed and the foot thereof, one or more retractable wheeled undercarriages mounted beneath the head of the bed, each of said undercarriages having a freely castoring wheel, the said pair of undercarriages being supported by at least one hydraulically operated jack and being mechanically connected so as to move together, and the said undercarriage or undercarriages under the head of the bed, being supported independently of the said pair of undercarriages by a further hydraulically operated jack or jacks.

2. A hospital bed according to Claim 1 wherein the said pair of undercarriages are located near the centre of gravity of the bed so that the greater part of the weight of the bed can be carried thereby.

3. A hospital bed according to Claims 1 or 2 wherein the hydraulic mechanism is arranged to push down the undercarriage or undercarriages under the head of the bed, in advance of the said pair of undercarriages, the operating jacks for which are balanced.

4. A hospital bed according to any of the preceding claims wherein the fluid for the hydraulic mechanism is contained within a reservoir constituted by a tubular transverse bracing member of the chassis.

5. A hospital bed according to Claim 4 wherein the ends of the said bracing member are located in holes cut in the chassis, and the ends of the said member are sealed by bulkheads fixed therein.

6. A hospital bed according to Claim 5 wherein the bulkheads are drilled to permit the passage of a pipe or pipes of the hydraulic mechanism through the said bracing member, suitable glands being provided where the pipes enter or leave the bulkheads.

7. A hospital bed according to any of the preceding claims wherein the fluid pressure for the hydraulic jacks is derived from pumps operated by a pedal at the foot of the bed.

8. A hospital bed according to any of the preceding claims wherein the fluid pressure in the hydraulic mechanism is released by a valve operated by a foot lever at the foot of the bed.

9. A hospital bed according to any of the preceding claims wherein each wheel is supported by a linkage incorporating a lever pivoted on the chassis, said lever being adapted to be rocked by a jack to move the wheel in relation to the chassis.

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PROVISIONAL SPECIFICATION.

Improvements in Hospital Beds.

We, ESSEX AERO LIMITED, a British Company, and REGINALD JACK CROSS and FREDERICK GLYN HUGHES, both British Subjects, all of London East Airport, Gravesend, Kent, do hereby declare the nature of this invention to be as follows:—

This invention has for its object to provide certain improvements in hospital beds and analogous articles of furniture of the kind having a platform mounted upon a separate chassis furnished with retractable wheeled undercarriages and hydraulic jack mechanism for operating the same to raise from stationary feet on to the undercarriage wheels or vice versa.

In a bed according to the invention the longitudinal members of the chassis are connected at one end by a tubular cross-member closed at each end to constitute a tank or reservoir for the working liquid of the hydraulic jacking system.

Where the chassis longitudinals are of tubular construction the ends of the reservoir cross-member may be welded to the borders or holes cut in the inner sides thereof at each end, at a position near to the feet of the chassis. The ends of the reservoir tube are sealed by bulk-heads welded in position and drilled to receive pipe connections of the system passed through same by means of suitable gland-members. Where it is desired to provide an equalising pipe-connection between two of the undercarriage jacks said connection may pass through a tube extending lengthwise through the reservoir, emerging at each end through the bulk-head.

The reservoir tube is conveniently provided with a filler-cap and drain plug.

Dated this 10th day of November, 1949.

BREWER & SON,
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London, W.C.2.

Abingdon: Printed for Her Majesty's Stationery Office, by Burgess & Son (Abingdon), Ltd.—1952.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2,
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683,072 COMPLETE SPECIFICATION
7 SHEETS
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SHEET 1

Fig.1.

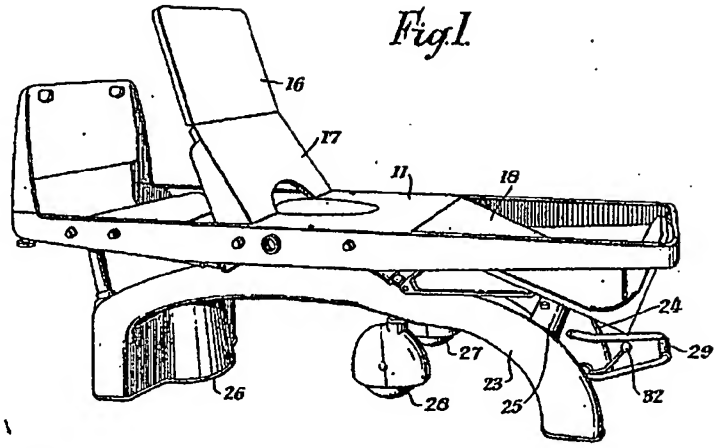
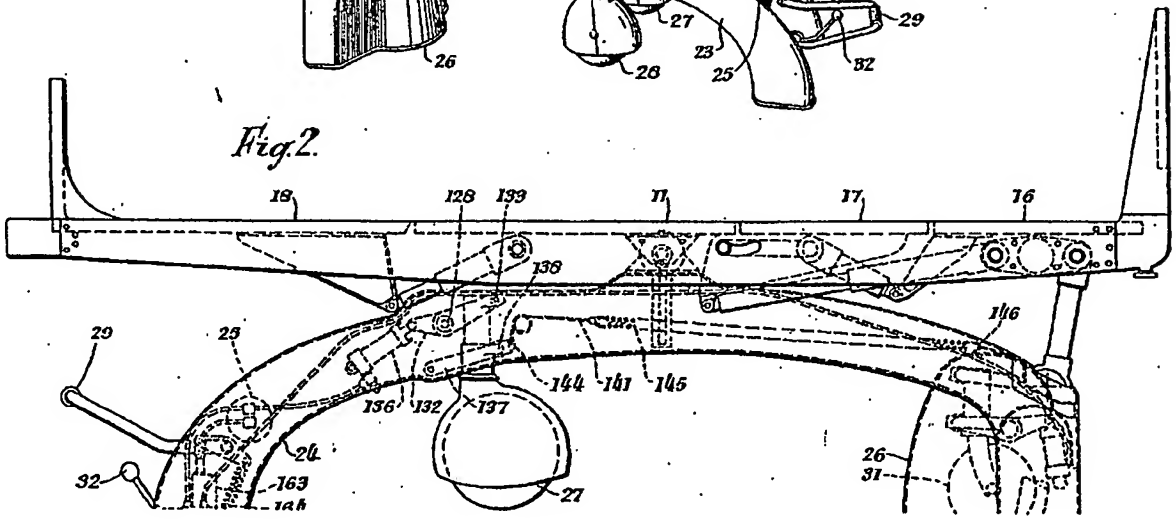


Fig.2.



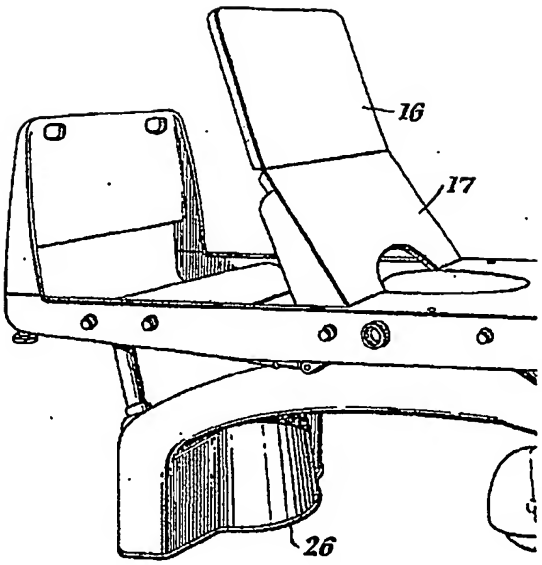


Fig. 2.

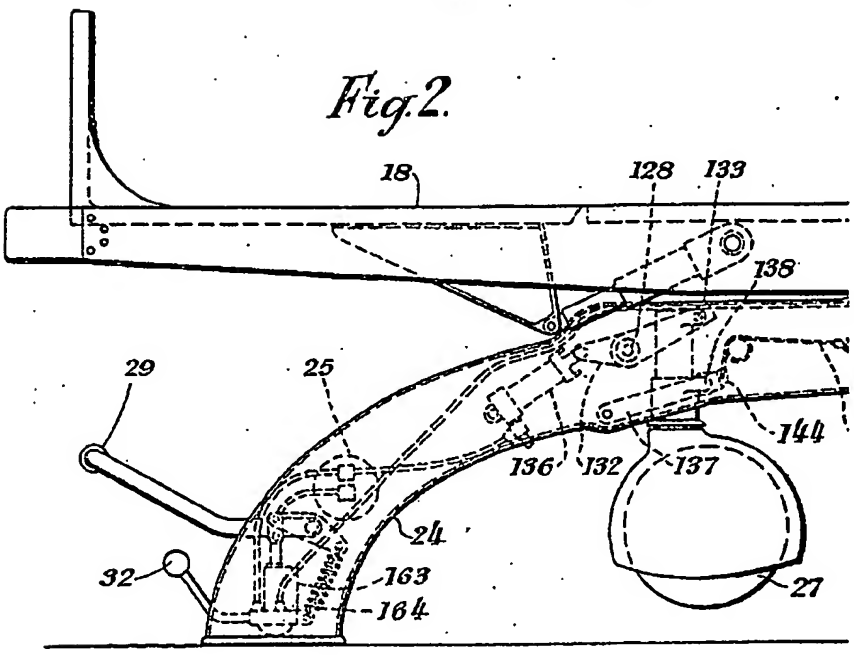


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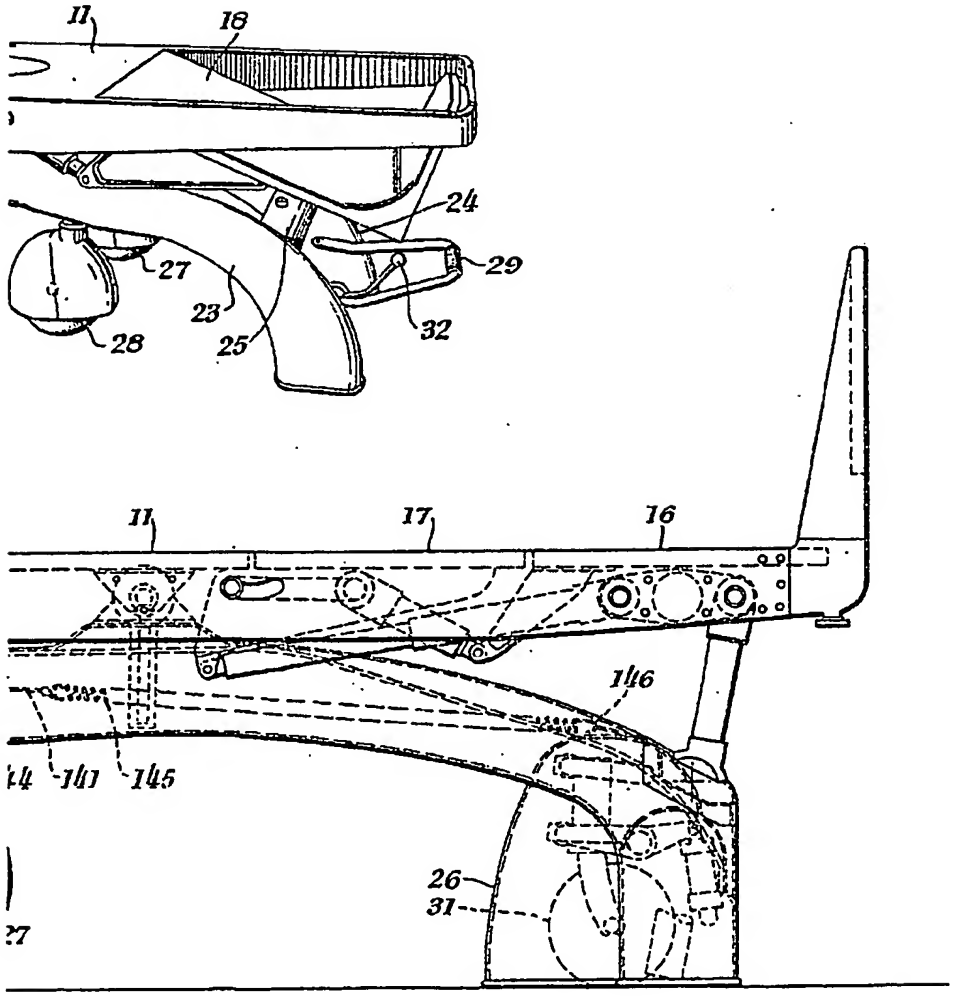
Fig.1.



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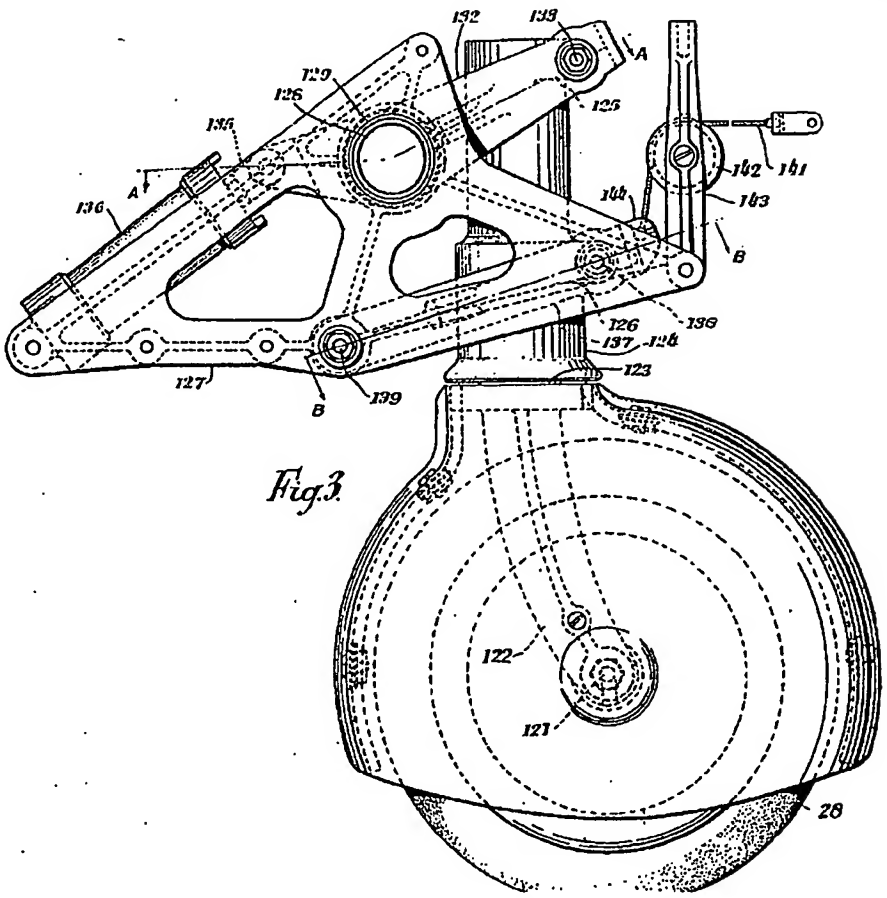

Fig. 3.

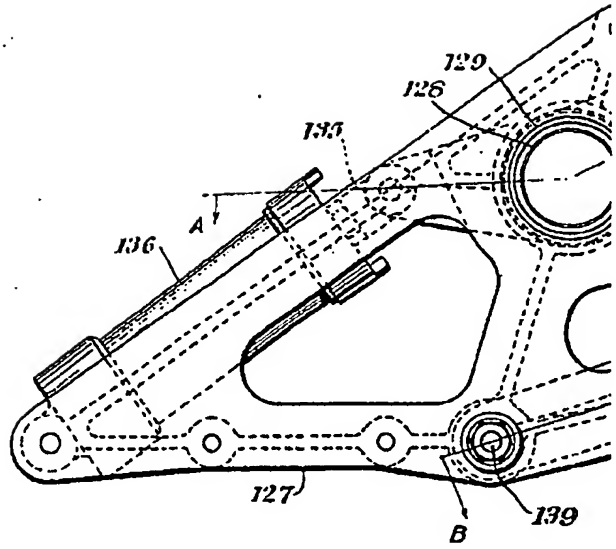

Fig.3

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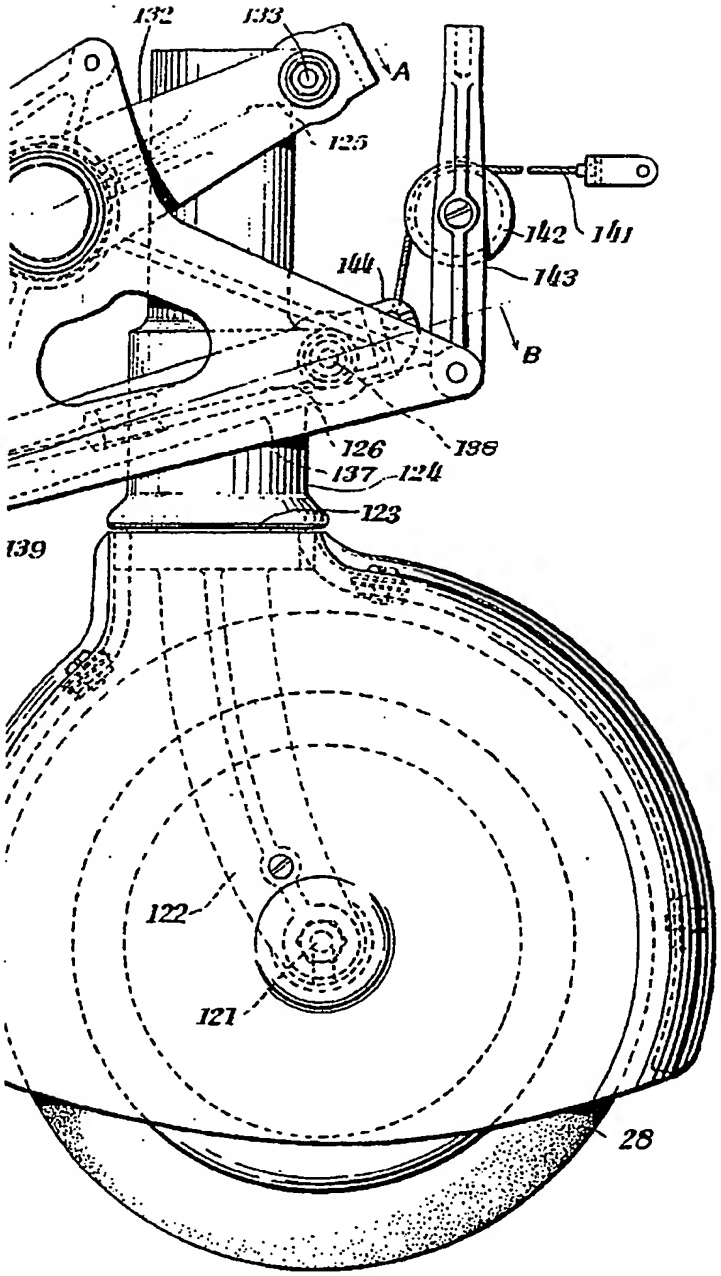

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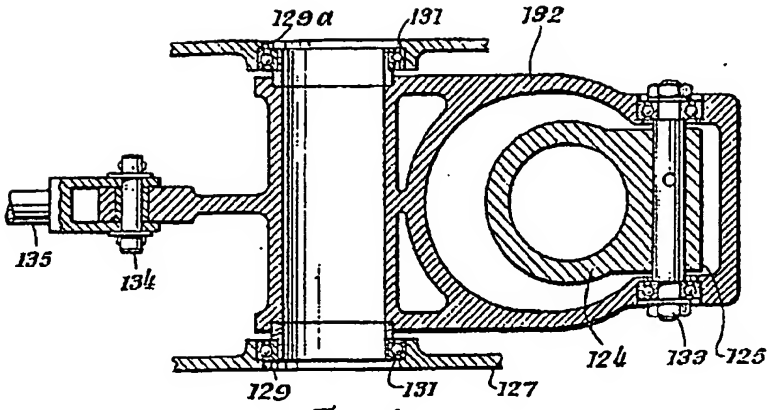
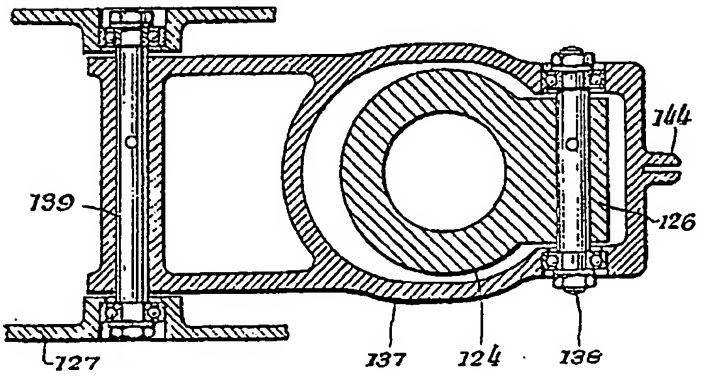


Fig. 4.

Fig. 5.



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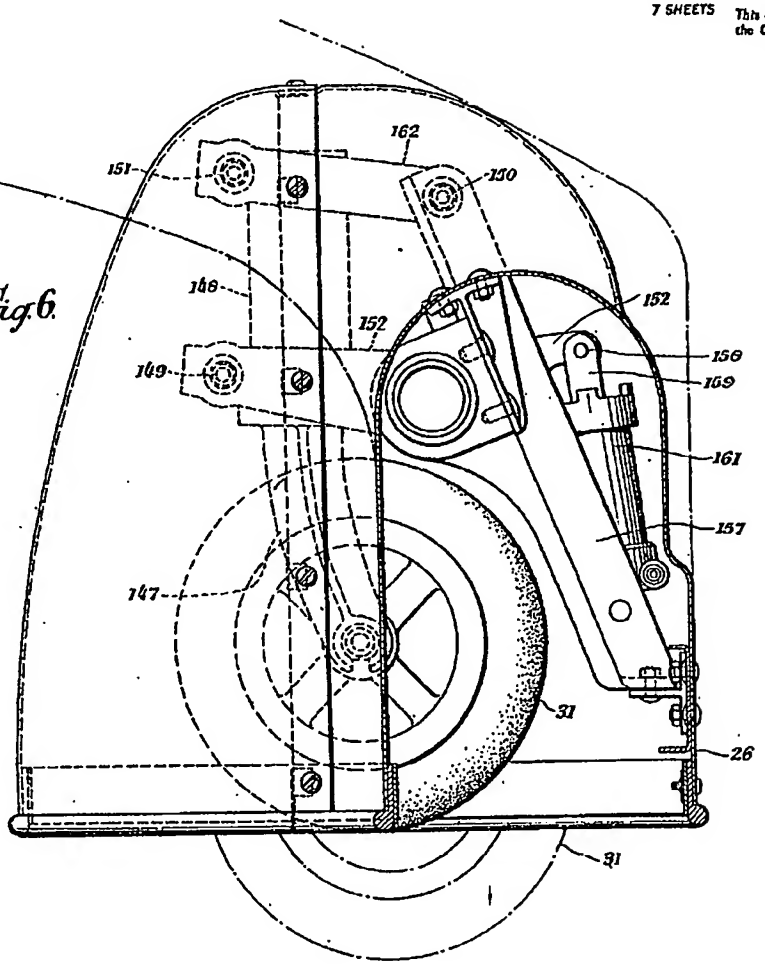
SHEET 4

Fig. 6.



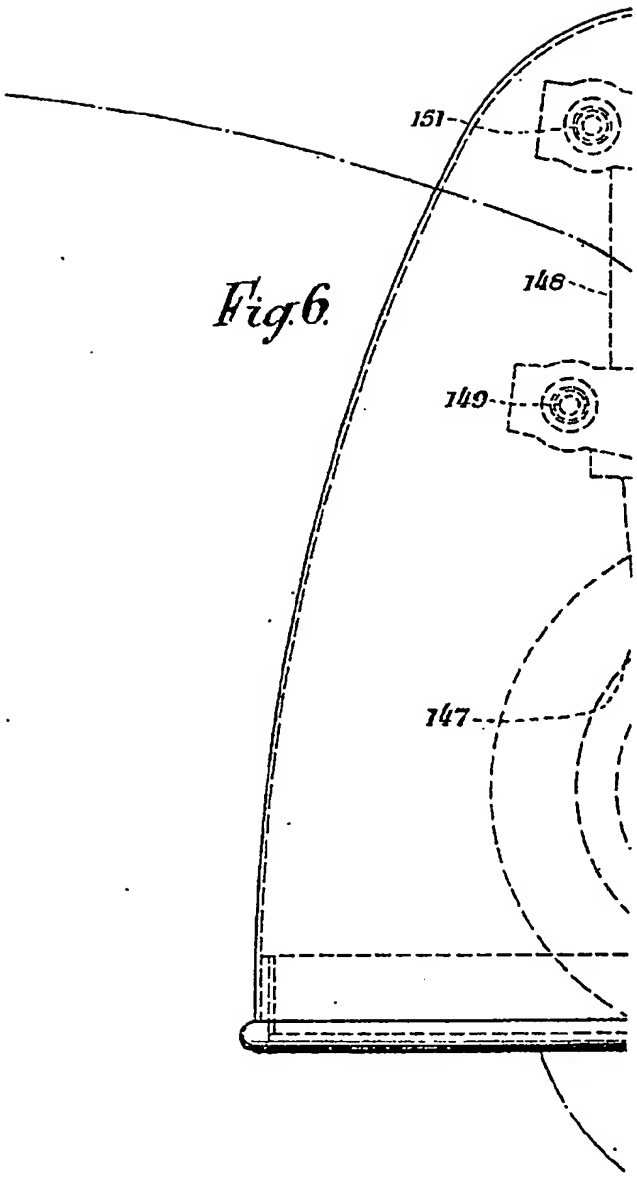


Fig.6.

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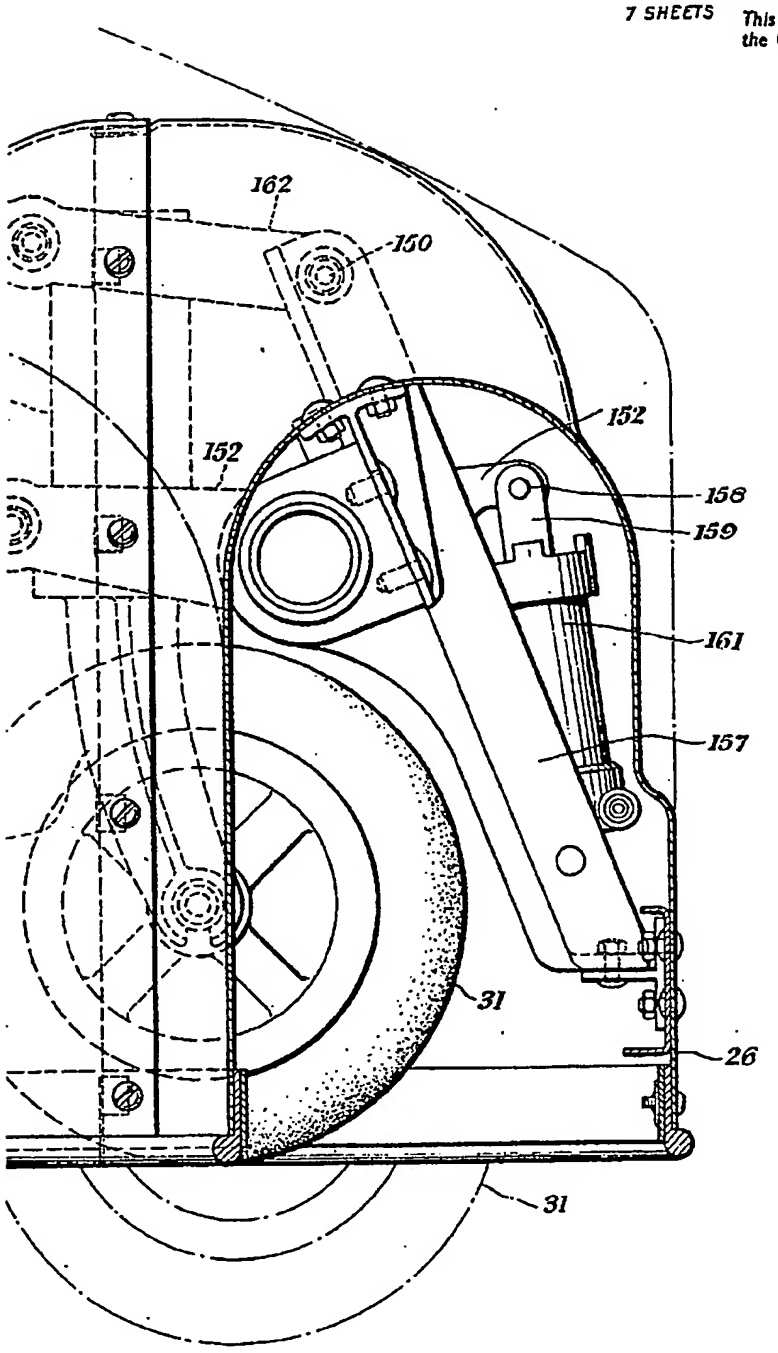

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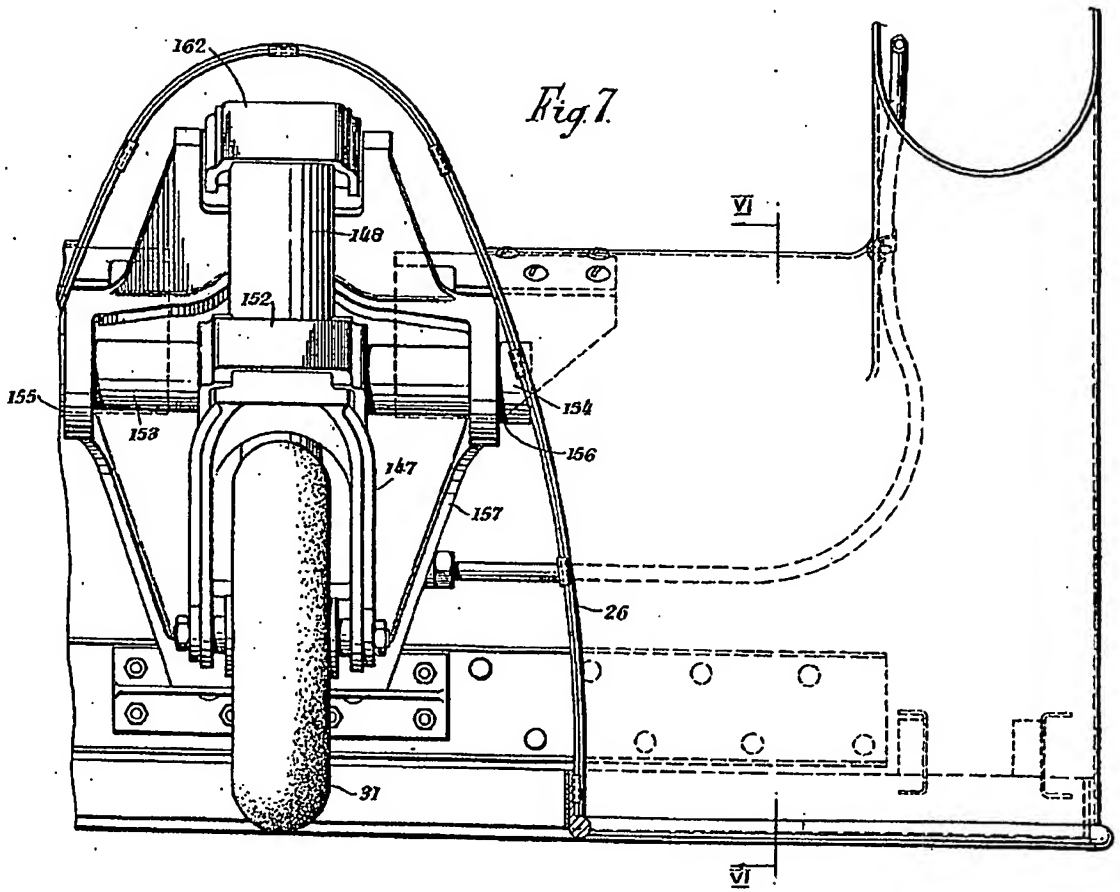
SHEET 5

Fig. 7.



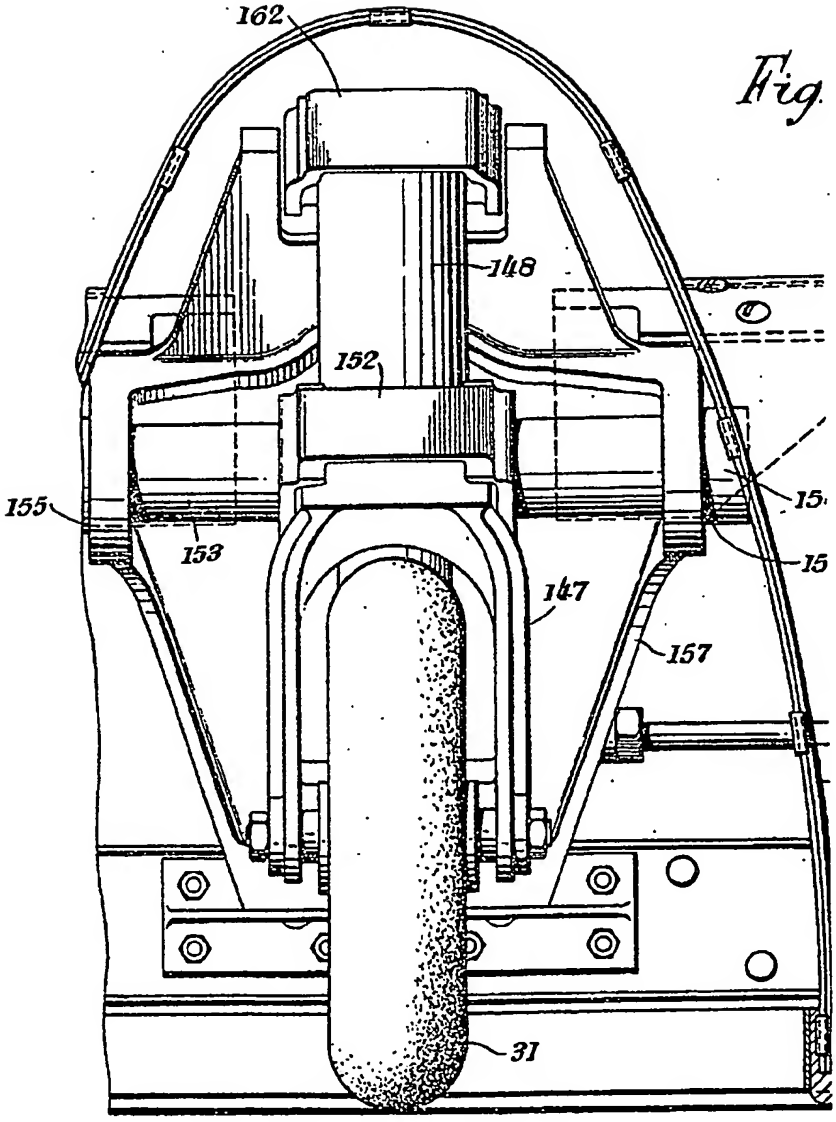


Fig.

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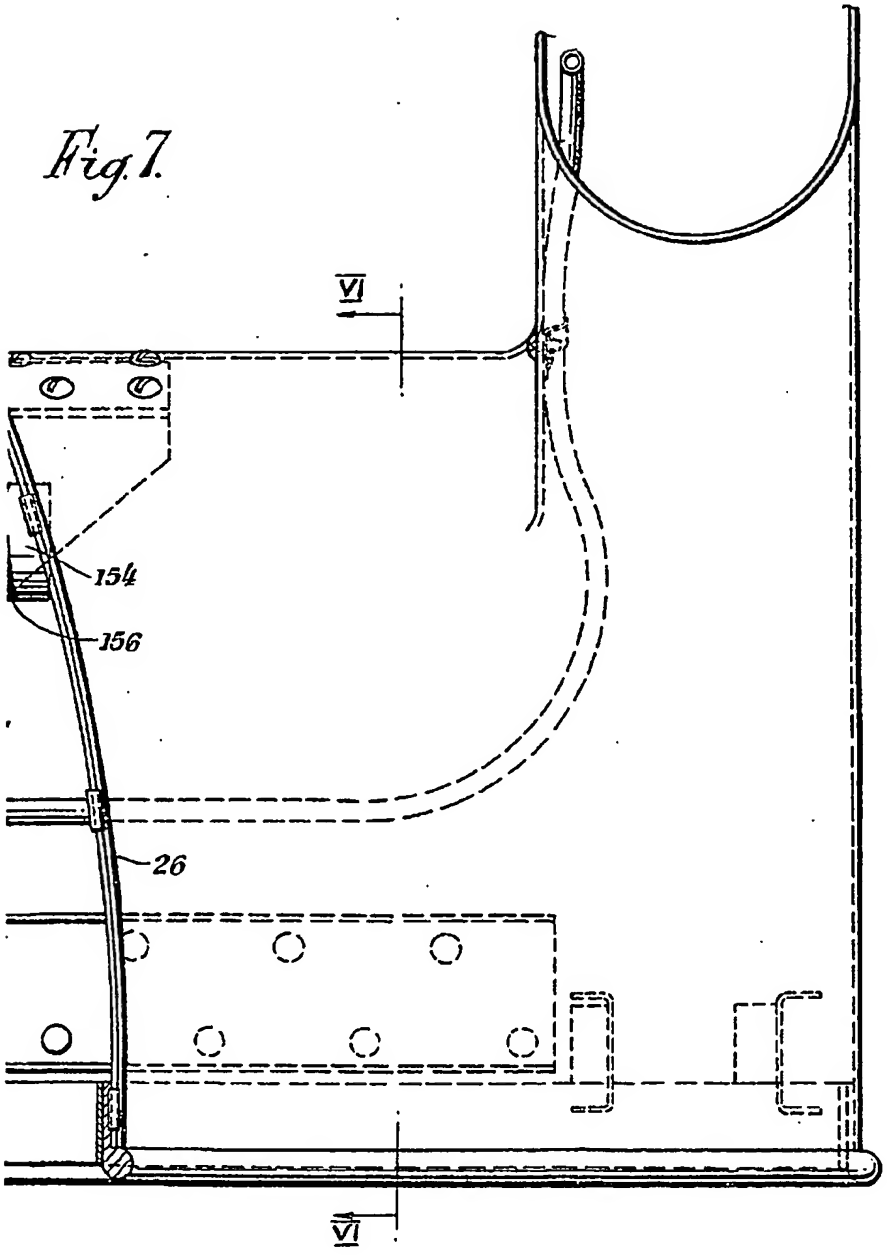
Fig. 7.



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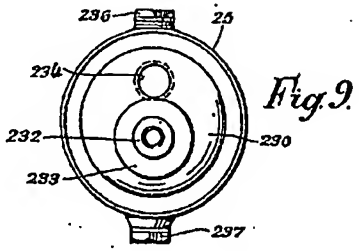

Fig.9.

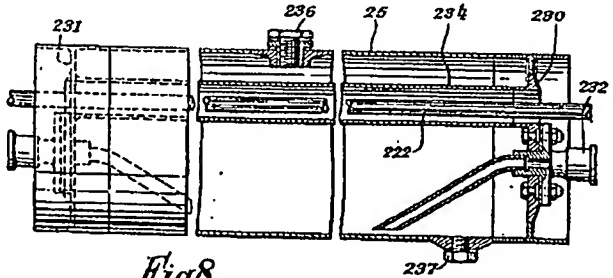

Fig.8.

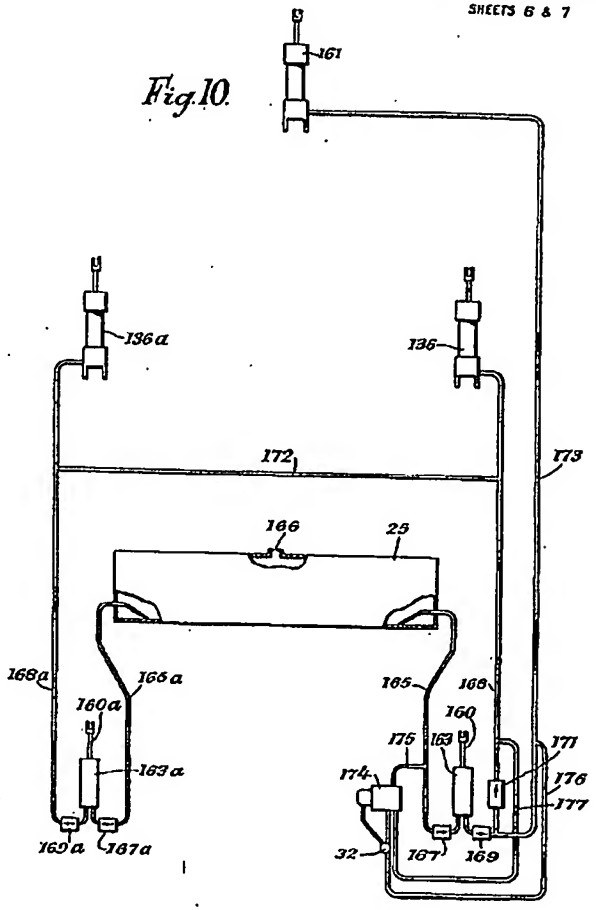

Fig.10.

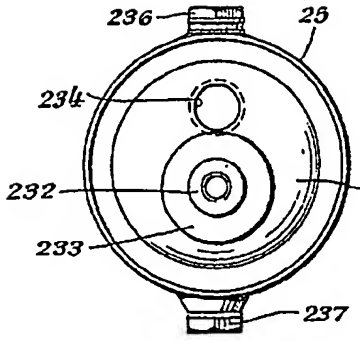

Fig. 9.

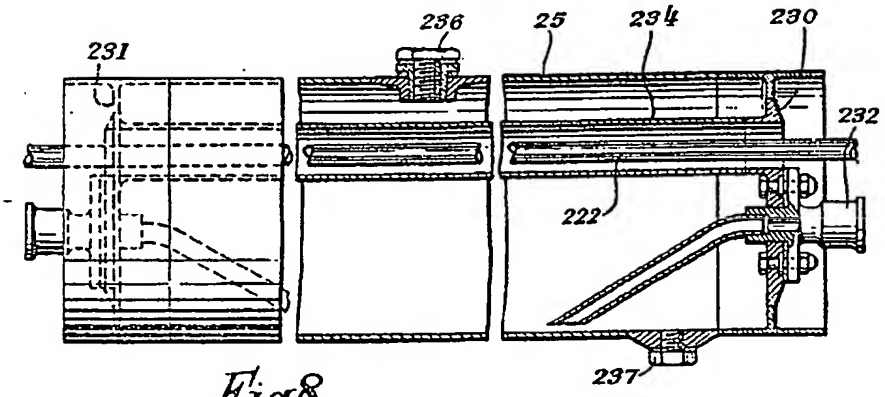

Fig. 8.

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Fig. 10.